APPENDIX A
PART 572(J) NINE-MONTH-OLD CHILD TEST DUMMY
PERFORMANCE VERIFICATION TEST PROCEDURE

1. PURPOSE

The purpose of this laboratory procedure is to provide child dummy users (independent testing laboratories under contract with the Office of Vehicle Safety Compliance - OVSC) with standard test procedures for conducting receiving-inspection and child restraint system dynamic test usage performance verification so that repetitive and correlative test results can be obtained. The following four component verification tests have been developed that establish a uniform verification procedure for all users prior to use of the child dummy in dynamic testing, and a means of checking certification of the dummy for purposes of compliance following testing.

LUMBAR FLEXION TEST

The performance criteria specified is intended to describe measuring tools with sufficient precision to give repetitive and correlative results under similar test conditions and to reflect adequately the protective performance of an item of motor vehicle equipment with respect to human occupants.

2. APPLICATION

This procedure does not in itself impose duties or liabilities on any person. It is a description of tools that measure the performance of occupant protection systems required by the safety standards that incorporate it. It is designed to be referenced by, and become a part of, the test procedures specified in motor vehicle safety standards such as Standard 213, Child Restraint Systems, Standard 209, Seat Belt Assemblies, and Standard 210, Seat Belt Assembly Anchorages.

3. TERMINOLOGY

Terms describing parts of the dummy, such as "head," are the same as names for corresponding parts of the human body.

4. GENERAL REQUIREMENTS

A. The dummy consists of:

(1) The assembly specified in drawing LP 1049/A, March 1979, which is described in its entirety by means of approximately 54 separate drawings and specifications 1049/1 through 1049/54; and

(2) a parts list LP 1049/0 (5 sheets); and

APPENDIX A....Continued:

(3) a report entitled, “The TNO P3/4 Child Dummy users Manual,” January 1979, published by Instituut voor Wegtransportmiddelen TNO.

B. Adjacent dummy segments are joined in a manner such that throughout the range of motion and also under simulated crash-impact conditions, there is no contact between metallic elements except for contacts that exist under static conditions.

C. The structural properties of the dummy are such that the dummy conforms to this procedure in every respect both before and after being used in dynamic sled tests specified by Standard 213.

5. DUMMY SEGMENTS

A. Head

The head consists of the assembly shown in drawing LP 1049/A and conforms to each of the applicable drawings listed under LP 1049/0 through 54.

B. Head-Neck

The head-neck assembly shown in drawing 1049/A consists of parts specified as items 1 through 16 and in item 56.

C. Thorax

The thorax consists of the part of the torso shown in assembly drawing LP 1049/A and conforms to each of the applicable drawings listed under LP 1049/0 through 54.

6. TEST EXECUTION

A. LUMBAR SPINE FLEXURE

(1) When subjected to continuously applied force in accordance with the test procedure, the lumbar spine assembly shall flex by an amount that permits the thoracic spine to rotate from its initial position in accordance with Figure A-1 by 40 degrees at a force level of not less than 80 N (18 pounds) and not more than 97.9 N (22 pounds), and straighten upon removal of the force to within 5 degrees of its initial position.

APPENDIX A....Continued:

(2) TEST PROCEDURE

(A) The lumbar spine flexure test is conducted on a dummy assembly as shown in Figures A-1, but with the all arms and all head-neck parts removed.

(B) With the torso assembled in an upright position, adjust the lumbar cable by tightening the adjustment nut for the lumbar vertebrae until the spring is compressed to 2/3 of its unloaded length.

(C) Position the dummy in an upright seated position on a seat as indicated in Figures A-1 (lower legs do not need to be removed, but must be clamped firmly to the seating surface), ensuring that all dummy component surfaces are clean, dry and untreated unless otherwise specified.

(D) Firmly affix the dummy to the seating surface through the pelvis at the hip joints by suitable clamps that also prevent any relative motion with respect to the upper legs during the test in (2)(C) of this part. Install a pull attachment at the neck to torso juncture as shown in Figure A-1.

(E) Flex the thorax forward 50 degrees and then rearward as necessary to return it to its initial position.

(F) Apply a forward pull force in the midsagittal plane at the top of the neck adapter so that at 40 degrees of the lumbar spine flexion the applied force is perpendicular to the thoracic spine box. Apply the force at any torso deflection rate between 0.5 and 1.5 degrees per second up to 40 degrees of flexion but no further; maintain 40 degrees of flexion for 10 seconds; and record the highest applied force during that time. Release all force as rapidly as possible and measure the return angle three minutes after release.

APPENDIX A....Continued:

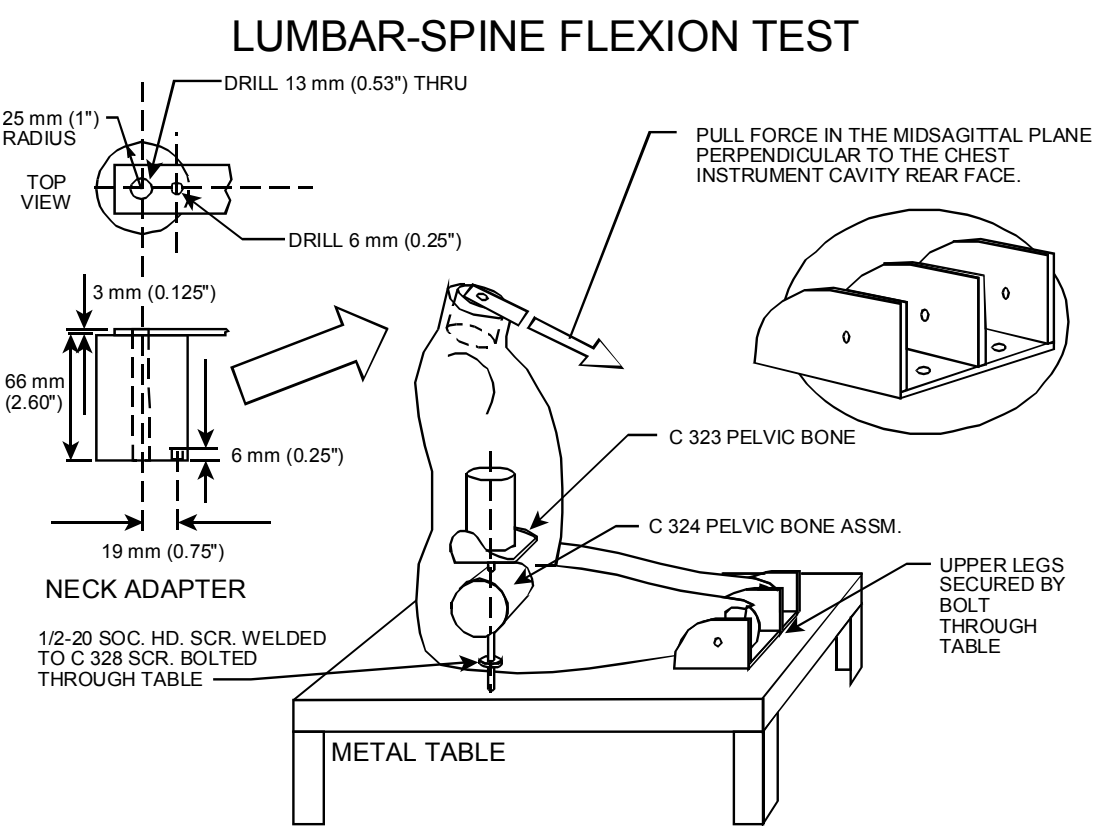


FIGURE A-1

B. TEST CONDITIONS AND DUMMY ADJUSTMENT

(1) With the complete torso on its back lying on a horizontal surface and the neck assembly mounted and shoulders on the edge of the surface, adjust the neck such that the head bolt is lowered 10 ± 1 mm (0.40 ± 0.05 inches) after a vertically applied load of 50 N (11.25 pounds) applied to the head bolt is released.

(2) With the complete torso on its back with the adjusted neck assembly as specified above, and lying on a horizontal surface with the shoulders on the edge of the surface, mount the head and tighten the head bolt and nut firmly, with the head in horizontal position. Adjust the head joint at the force between 1-2g, which just supports the head's weight.

(3) using the procedures described below, limb joints are set at the force between 1-2g, which just supports the limbs' weight when the limbs are extended horizontally forward:

APPENDIX A....Continued:

(a) With the complete torso lying with its front down on a horizontal surface, with the hip joint just over the edge of the surface, mount the upper leg and tighten hip joint nut firmly. Adjust the hip joint by releasing the hip joint nut until the upper leg just starts moving.

(b) With the complete torso and upper leg lying with its front up on a horizontal surface, with the knee joint just over the edge of the surface, mount the lower leg and tighten knee joint firmly. Adjust the knee joint by releasing the knee joint nut until the lower leg just starts moving.

(c) With the torso in an upright position, mount the upper arm and tighten firmly the adjustment bolts for the shoulder joint with the upper arm placed in a horizontal position. Adjust the shoulder joint by releasing the shoulder joint nut until the upper arm just starts moving.

(d) with the complete torso in an upright position and upper arm in a vertical position, mount the forearm in a horizontal position and tighten the elbow hinge bolt and nut firmly. Adjust the elbow joint nut until the forearm just starts moving.

(4) with the torso assembled in an upright position, the adjustment nut for the lumbar vertebrae is tightened until the spring is compressed to 2/3 of its unloaded length.

(5) Performance tests are conducted at any temperature from 19□C to 26□C (66□F to 78□F) and at any relative humidity from 10% to 70% after exposure of the dummy to these conditions for a period of not less than four hours.

(6) Performance test of the same component, segment, assembly or fully assembled dummy are separated in time by a period of not less than 20 minutes unless other wise specified.

(7) Surfaces of the dummy components are not painted except as specified in the part or in drawing incorporated by this part.

APPENDIX B
PART 572(C) THREE-YEAR-OLD CHILD TEST DUMMY
PERFORMANCE VERIFICATION TEST PROCEDURE

1. PURPOSE

The purpose of this laboratory procedure is to provide child dummy users (independent testing laboratories under contract with the Office of Vehicle Safety Compliance - OVSC) with standard test procedures for conducting receiving-inspection and child restraint system dynamic test usage performance verification so that repetitive and correlative test results can be obtained. The following four component verification tests have been developed that establish a uniform verification procedure for all users prior to use of the child dummy in dynamic testing, and a means of checking certification of the dummy for purposes of compliance following testing.

A. HEAD IMPACT TEST

B. HEAD-NECK PENDULUM TEST

C. CHEST IMPACT TEST

D. LUMBAR FLEXION TEST

The performance criteria specified is intended to describe measuring tools with sufficient precision to give repetitive and correlative results under similar test conditions and to reflect adequately the protective performance of an item of motor vehicle equipment with respect to human occupants.

2. APPLICATION

This procedure does not in itself impose duties or liabilities on any person. It is a description of tools that measure the performance of occupant protection systems required by the safety standards that incorporate it. It is designed to be referenced by, and become a part of, the test procedures specified in motor vehicle safety standards such as Standard 213, Child Restraint Systems, Standard 209, Seat Belt Assemblies, and Standard 210, Seat Belt Assembly Anchorages.

3. TERMINOLOGY

Terms describing parts of the dummy, such as "head," are the same as names for corresponding parts of the human body.

A. Adjacent segments are joined in a manner such that throughout the range of motion and also under simulated crash-impact conditions, there is no contact between metallic elements except for contacts that exist under static conditions.

APPENDIX B....Continued:

B. The structural properties of the dummy are such that the dummy conforms to this procedure in every respect both before and after being used in dynamic sled tests specified by Standard 213.

C. Performance tests of the same component, segment, assembly or fully assembled dummy are separated in time by a period of not less than 20 minutes unless otherwise specified by the COTR.

D. Surfaces of the dummy components are not painted except as specified.

E. Each three-year-old child dummy will contain an identification serial number marked on the outer skin. This number shall be used throughout the verification test program. In preparation for the verification tests, each dummy will be partially disassembled and inspected for damaged areas or components showing impending failure, which might affect its performance in subsequent tests.

All defects will be noted in the verification test report along with a list of replacement components added to the child dummy.

After the initial inspection, the outer vinyl skin of the child dummy will be cleaned to remove any residues, which may have remained from previous testing or usage. The child dummy will then be reassembled in preparation for the verification tests. The dummy will be instrumented with triaxial accelerometers in the head and chest at this time.

5. TEST EXECUTION

A. TEST CONDITIONS AND INSTRUMENTATION

(1) (A) The test probe used for HEAD IMPACT TEST and CHEST IMPACT TEST is a cylinder 76 mm (3 inches) in diameter, 350.5 mm (13.8 inches) long and weighs 4.7 kg (10 pounds 6 ounces). Its impacting end has a flat right face that is rigid and that has an edge radius of 12.7 mm (0.5 inches).

(B) The head and thorax assembly may be instrumented with a Type A or Type C accelerometer.

[1] Type A accelerometer is defined in drawing SA-572 S1.

[2] Type C accelerometer is defined in drawing SA-572 S2.

APPENDIX B....Continued:

(2) HEAD ACCELEROMETERS

Install one of the triaxial accelerometers specified above on a mounting block located on the horizontal transverse bulkhead as shown in the drawings sub-referenced under assembly SA 103C 010 so that the seismic mass centers of each sensing element are positioned as specified in this paragraph, relative to the head accelerometer reference point located at the intersection of a line connecting the longitudinal centerlines of the transfer pins in the side of the dummy head with the midsagittal plane of the dummy head.

(A) The sensing elements of the Type C triaxial accelerometer are aligned as follows (see Figure B-1 on next page):

[1] Align one sensitive axis parallel to the vertical bulkhead and coincident with the midsagittal plane, with the seismic mass center located 5.1 mm (0.2 inches) dorsal (rearward) to, and 2.5 mm (0.1 inches) inferior (downward) to the head accelerometer reference point.

[2] Align the second sensitive axis with the horizontal plane, perpendicular to the midsagittal plane, with the seismic mass center located 2.5 mm (0.1 inches) inferior (downward), 10.2 mm (0.4 inches) to the right of, and 22.9 mm (0.9 inches) dorsal (rearward) to the head accelerometer reference point.

[3] Align the third sensitive axis so that it is parallel to the midsagittal and horizontal planes, with the seismic mass center located 2.5 mm (0.1 inches) inferior (downward) to, 15.2 mm (0.6 inches) dorsal (rearward) to, and 10.2 mm (0.4 inches) to the right of the head accelerometer reference point.

[4] All seismic mass centers are positioned within ± 1.27 mm (± 0.05 inches) of the specified locations.

(B) The sensing elements of the Type A accelerometer are aligned as follows:

[1] Align one sensitive axis parallel to the vertical bulkhead and coincident with midsagittal planes, with the seismic mass center located from 5.1 to 11.94 mm (0.2 to 0.47 inches) dorsal to, from 0.25 mm (0.01 inches) inferior (downward) to 5.33 mm (0.21 inches) superior (upward), and from 0.0 to

APPENDIX B....Continued:

PLANES OF DIRECTION

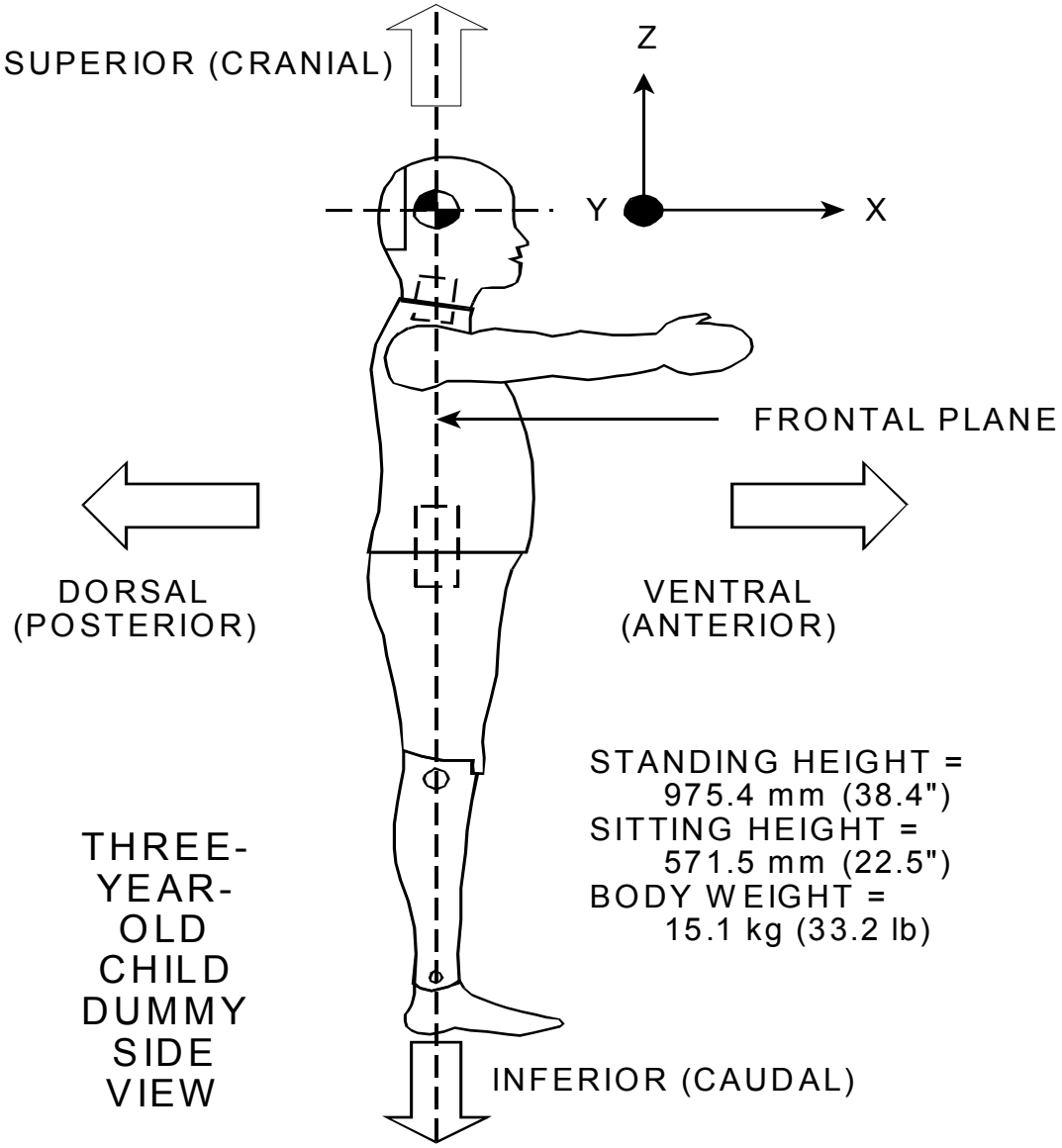


FIGURE B-1

APPENDIX B....Continued:

4.32 mm (0.0 to 0.17 inches) left of the head accelerometer reference point.

[2] Align the second sensitive axis with the horizontal plane perpendicular to the midsagittal plane, with the seismic mass center located 2.5 to 3.30 mm (0.1 to 0.13 inches) inferior to, 4.3 to 10.2 mm (0.17 to 0.4 inches) to the right of, and 11.94 to 22.9 mm (0.47 to 0.9 inches) dorsal of the head accelerometer reference point.

[3] Align the third sensitive axis so that it is parallel to the midsagittal and horizontal planes, with the seismic mass center located 2.5 to 3.30 mm (0.1 to 0.13 inches) inferior to, 15.2 to 20.57 mm (0.6 to 0.81 inches) dorsal to, and from 4.31 mm (0.17 inches) left to 10.2 mm (0.4 inches) right of the head accelerometer reference point.

(3) THORAX ACCELEROMETERS

Install one of the triaxial accelerometers specified in 5.A.(1)(b) on a mounting plate attached to the vertical transverse bulkhead shown in the drawing sub-referenced under assembly No. SA 103C 030 in drawing SA 103 001, so that the seismic mass centers of each sensing element are positioned as specified in this paragraph, relative to the thorax accelerometer reference point located in the midsagittal plane 76 mm (3 inches) above the top surface of the lumbar spine, 7.6 mm (0.3 inches) dorsal to the accelerometer mounting plate surface.

(A) The sensing elements of the Type C triaxial accelerometer are aligned as follows:

[1] Align one sensitive axis parallel to the vertical bulkhead and midsagittal planes, with seismic mass center located 5.1 mm (0.2 inches) to the left of, 2.5 mm (0.1 inches) inferior to, and 5.1 mm (0.2 inches) ventral to the thorax accelerometer reference point.

[2] Align the second sensitive axis so that it is in the horizontal transverse plane, and perpendicular to the midsagittal plane, with the seismic mass center located 5.1 mm (0.2 inches) to the right of, 2.5 mm (0.1 inches) inferior to, and 5.1 mm (0.2 inches) ventral (forward) to the thorax accelerometer reference point.

APPENDIX B....Continued:

[3] Align the third sensitive axis so that it is parallel to the midsagittal and horizontal planes, with the seismic mass center located 5.1 mm (0.2 inches) superior to, 12.7 mm (0.5 inches) to the right of, and 2.5 mm (0.1 inches) ventral (forward) to the thorax accelerometer reference points.

[4] All seismic mass centers shall be positioned within ± 1.27 mm (0.05 inches) of the specified locations.

(B) The sensing elements of the Type A triaxial accelerometer are aligned as follows:

[1] Align one sensitive axis parallel to the vertical bulkhead and midsagittal planes, with the seismic mass center located from 5.1 mm (0.2 inches) left to 7.11 mm (0.28 inches) right, from 1.27 mm to 3.81 mm (0.05 to 0.15 inches) inferior, and from 3.81 mm to 6.35 mm (0.15 to 0.25 inches) ventral of the thorax accelerometer reference point.

[2] Align the second sensitive axis so that it is in the horizontal transverse plane and perpendicular to the midsagittal plane, with the seismic mass center located from 1.52 mm (0.06 inches) left to 0.51 mm (0.02 inches) right of, from 2.5 mm (0.1 inches) inferior to 6.10 mm (0.24 inches) superior, and 3.81 mm to 6.35 mm (0.15 to 0.25 inches) ventral to the thorax accelerometer reference point.

[3] Align the third sensitive axis so that it is parallel to the midsagittal and horizontal planes, with the seismic mass center located 3.81 mm to 6.35 mm (0.15 to 0.25 inches) superior to, 7.11 mm to 12.7 mm (0.28 to 0.5 inches) to the right of, and from 2.5 mm (0.1 inches) ventral to 4.83 mm (0.19 inches) dorsal to the thorax accelerometer reference point.

(4) The outputs of accelerometers installed in the dummy, and of test apparatus specified by this part, are recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211a, DEC71, with channel classes as follows:

(A) Head acceleration - Class 1000

(B) Pendulum acceleration - Class 60

(C) Thorax acceleration - Class 180

APPENDIX B....Continued:

(5) The mountings for accelerometers have no resonance frequency less than 3 times the cut-off frequency of the applicable channel class.

(6) Limb joints are set at the force between 1g and 2g's, which just supports the limbs' weight when the limbs are extended horizontally forward. The force required to move a limb segment does not exceed 2g's throughout the range of limb motion.

(7) Performance tests are conducted at any temperature from 19°C (66°F) to 26°C (78°F) and at any relative humidity from 10 percent to 70 percent after exposure of the dummy to these conditions for a period of not less than 4 hours.

(8) For the performance tests the dummy is positioned in accordance with Figures B-2, B-3, B-7 and B-8 as follows:

(A) The dummy is placed on a flat, rigid, clean, dry, horizontal surface of Teflon sheeting with a smoothness of 1 mm (40 micro inches) and whose length and width dimensions are not less than 406 mm (16 inches), so that the dummy's midsagittal plane is vertical and centered on the test surface. For head tests, the seat has a vertical back support whose top is 315 mm ± 5.1 mm (12.4" ± 0.2") above the seating surface. The rear surfaces of the dummy's shoulders and buttocks are touching the back support. For thorax and lumbar spine tests, the seating surface is without the back support.

(B) The shoulder yokes are adjusted so that they are at the midpoint of their anterior-posterior travel with their upper surfaces horizontal.

(C) The dummy is adjusted for head impact and lumbar flexion tests so that the rear surfaces of the shoulders and buttocks are tangent to a transverse vertical plane.

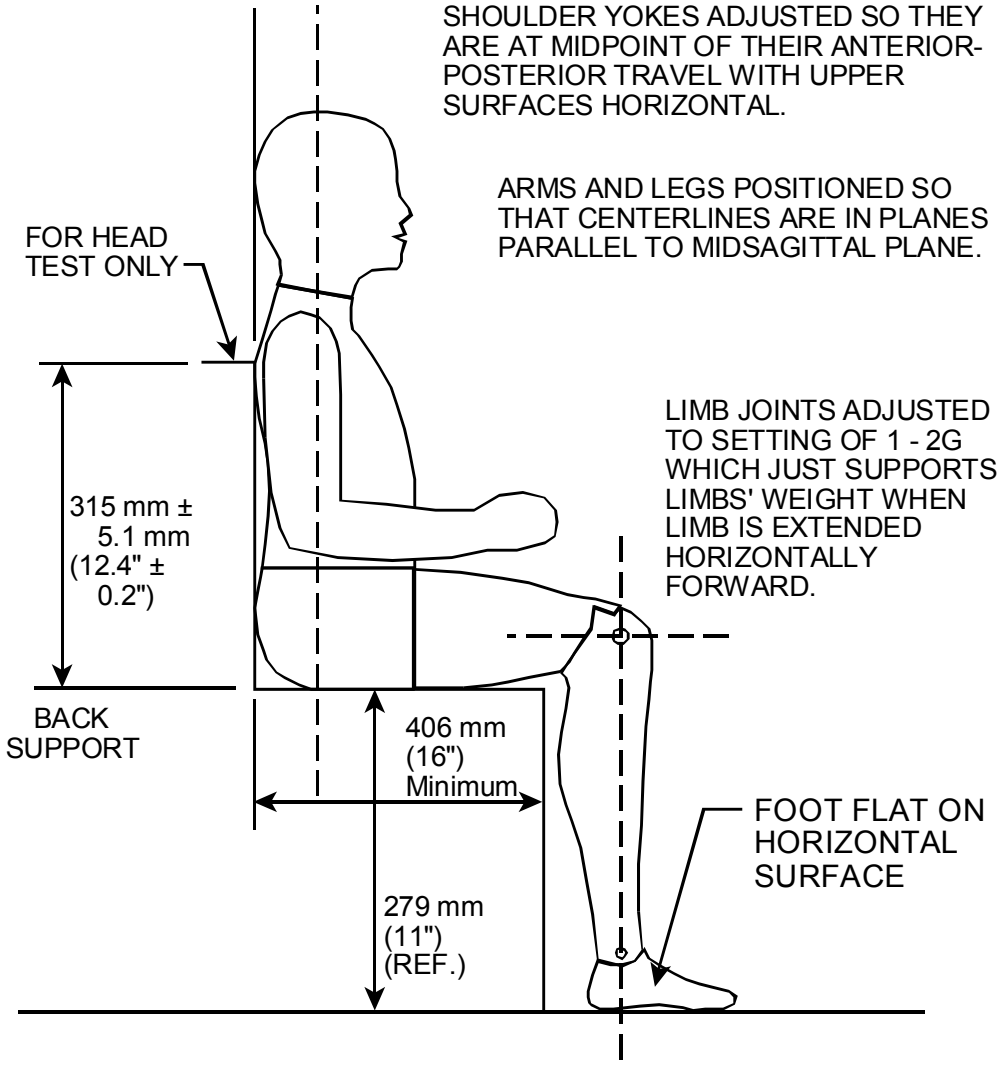
(D) The arms and legs are positioned so that their centerlines are in planes parallel to the midsagittal plane.

(9) Performance tests of the same component, segment, assembly or fully assembled dummy are separated in time by a period of not less than 20 minutes unless otherwise specified.

(10) Surfaces of the dummy components are not painted except as specified by the COTR.

APPENDIX B....Continued:

UPRIGHT SEATED POSITION



CHILD DUMMY IS PLACED ON A FLAT, RIGID, CLEAN, DRY, HORIZONTAL SURFACE OF TEFLON SHEETING WITH A SMOOTHNESS OF 40 MICROINCHES AND WHOSE LENGTH AND WIDTH DIMENSIONS ARE 406 mm (16") MINIMUM.

FIGURE B-2

APPENDIX B....Continued:

B. HEAD

(1) When the head is impacted by a test probe specified in 5.A.(1)(a) at 7 fps, then the peak resultant acceleration measured at the location of the accelerometer mounted in the head-form in according to 5.A.(1)(b) is not less than 95g's, and not more than 118g's.

(A) The recorded acceleration-time curve for this test is unimodal at or above the 50g level, and lies at or above that level for intervals:

[1] in the case of the head assembly specified in paragraph (a)(1) of this section, not less than 1.3 milliseconds (ms) and not more than 2.0 ms;

[2] in the case of the head assembly specified in paragraph (a)(2) of this section, not less than 2.0 ms and not more than 3.0 ms.

(B) The lateral acceleration vector shall not exceed 7g.

(2) TEST PROCEDURE

(A) Seat the dummy on a seating surface having a back support as specified in 5.A.(8), and shown in Figure B-3 on the next page, and orient the dummy in accordance with 5.A.(8) and adjust the joints of the limbs at any setting between 1g and 2g's, which just supports the limbs' weight when the limbs are extended horizontally forward.

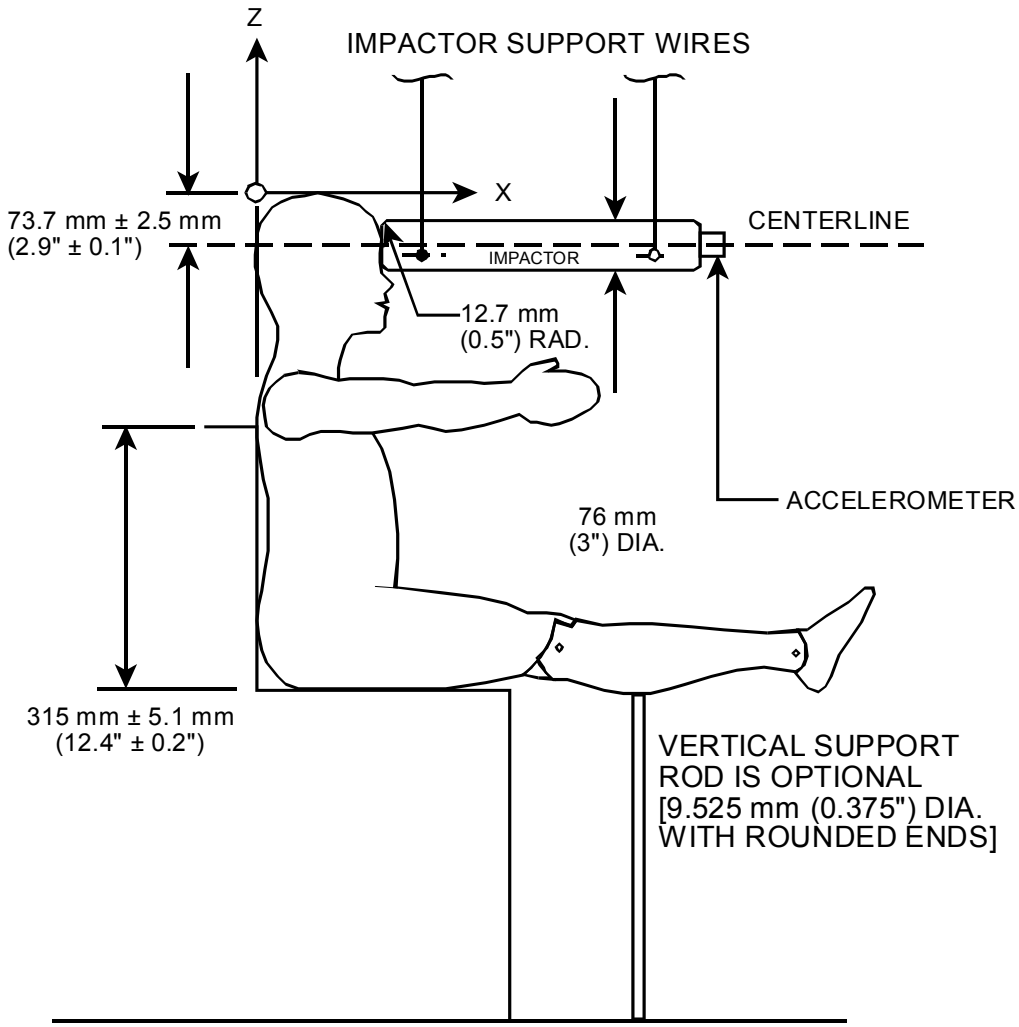
(B) Adjust the test probe so that its longitudinal centerline is at the forehead at the point of orthogonal intersection of the head midsagittal plane and the transverse plane which is perpendicular to the "Z" axis of the head (longitudinal centerline of the skull anchor) and is located 15.2 mm ± 2.5 mm (0.6 inches ± 0.1 inches) above the centers of the head center of gravity reference pins and coincides within 2 degrees with the line made by the intersection of horizontal and midsagittal planes passing through this point.

(C) Adjust the dummy so that the surface area on the forehead immediately adjacent to the projected longitudinal centerline of the test probe is vertical.

(D) Impact the head with the test probe so that at the moment of impact the probe's longitudinal centerline falls within 2 degrees of a horizontal line in the dummy's midsagittal plane.

APPENDIX B....Continued:

HEAD IMPACT TEST SETUP



NOTES:

1. DUMMY IMPACT SENSORS NOT USED IN THIS TEST MAY BE REPLACED BY EQUIVALENT DEAD WEIGHTS.
2. NO EXTERNAL SUPPORTS ARE REQUIRED ON THE DUMMY TO MEET SETUP SPECIFICATIONS
3. THE MIDSAGITTAL PLANE OF THE DUMMY IS VERTICAL WITHIN ± 1 DEGREE
4. THE MIDSAGITTAL PLANE OF THE HEAD IS CENTERED WITH RESPECT TO THE LONGITUDINAL CENTERLINE OF THE PENDULUM WITHIN 0.12 INCHES.

FIGURE B-3

APPENDIX B....Continued:

(E) Guide the probe during impact so that it moves with no significant lateral, vertical, or rotational movement.

(F) Allow a time period of at least 20 minutes between successive tests of the head.

C. NECK

(1) When the head-neck assembly is tested in accordance with paragraph C of this section, the head shall rotate in reference to the pendulum's longitudinal centerline a total of 84 degrees ± 8 degrees about its center of gravity, rotating to the extent specified in the following table at each indicated point in time, measured from impact, with the chordal displacement measured at its center of gravity.

The chordal displacement at time T is defined as the straight-line distance between ---

(A) the position relative to the pendulum arm of the head center of gravity at time zero, and

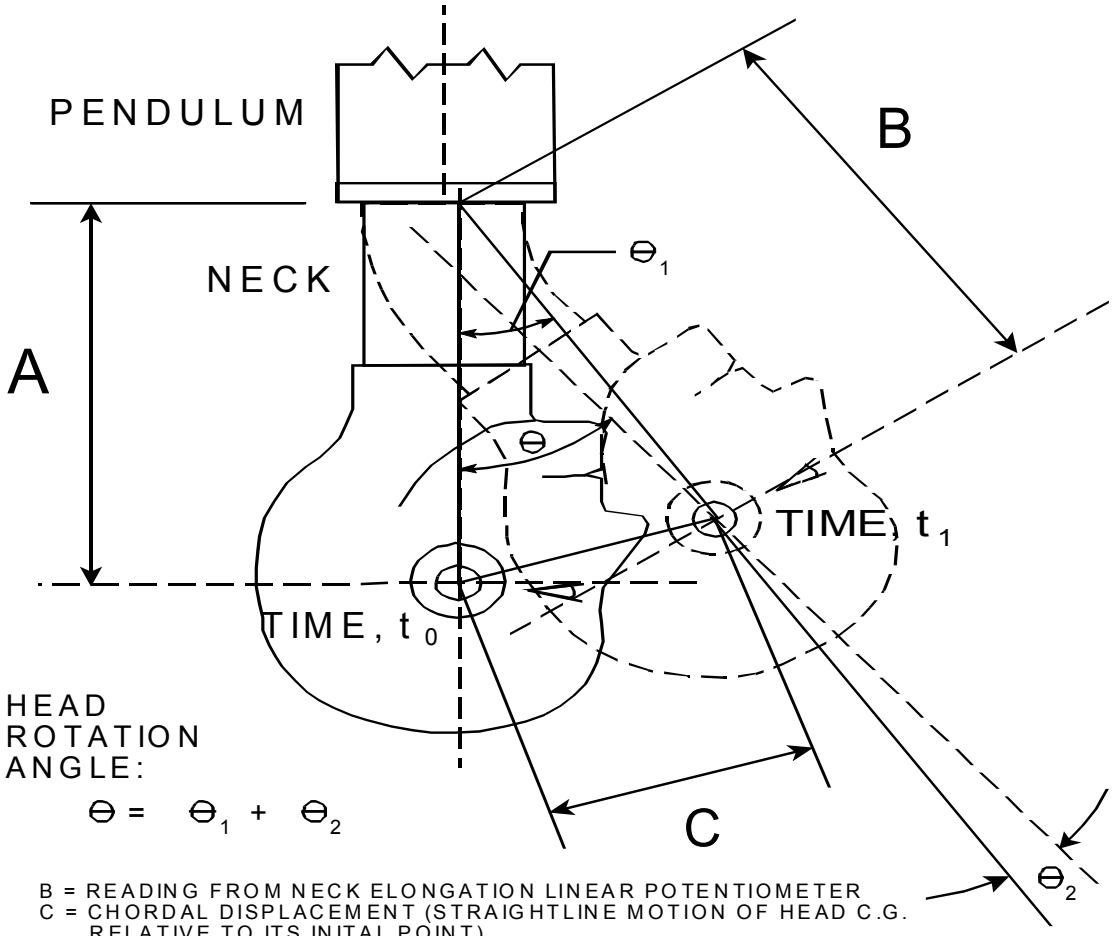
(B) the position relative to the pendulum arm of the head center of gravity at time T as illustrated by Figure B-4.

The peak resultant acceleration recorded at the location of the accelerometers mounted in the head-form in accordance with 5.A.(2) shall not exceed 30g's. The pendulum shall not reverse direction until the head's center of gravity returns to the original zero time position relative to the pendulum arm.

ROTATION	TIME ± (2+ 0.08t)	CHORDAL DISPLACEMENT ±20 mm (± 0.8")
0°	0 ms	0 mm (0")
30°	21 ms	55.9 mm (2.2")
60°	36 ms	109.2 mm (4.3")
Maximum	62 ms	147.3 mm (5.8")
60°	91 ms	109.2 mm (4.3")
30°	108 ms	55.9 mm (2.2")
0°	123 ms	0 mm (0")

APPENDIX B….Continued:

CALCULATION OF CHORDAL DISPLACEMENT



B = READING FROM NECK ELONGATION LINEAR POTENTIOMETER
C = CHORDAL DISPLACEMENT (STRAIGHTLINE MOTION OF HEAD C.G. RELATIVE TO ITS INITAL POINT)
Θ_1 = ANGLE READING FROM PENDULUM MOUNTED ROTARY POT.
Θ_2 = ANGLE READING FROM HEAD MOUNTED ROTARY POT.
COSINE LAW - THE SQUARE OF THE LENGTH OF ANY SIDE OF ANY TRIANGLE IS EQUAL TO THE SUM OF THE SQUARES OF THE LENGTHS OF THE OTHER TWO SIDES MINUS TWICE THEIR PRODUCT TIMES THE COSINE OF THE INCLUDED ANGLE.. $C^2 = A^2 + B^2 - 2AB\cos_1 \Theta$
B = A + e where e is the increase in A measured by the linear potentiometer

FIGURE B-4

APPENDIX B....Continued:

(2) Test Procedure:

(A) Mount the head and neck on a rigid pendulum as specified in Figures B-5 and B-6, so that the head's midsagittal plane is vertical and coincides with the plane of motion of the pendulum's longitudinal centerline. Mount the neck directly to the pendulum as shown in Figures B-5 and B-6.

(B) Release the pendulum and allow it to fall freely from a height such that the velocity at impact is 5.18 ± 0.30 meters per second (mps) (17.00 ± 1.0 feet per second (fps)), measured at the center of the accelerometer.

(C) Decelerate the pendulum to a stop with an acceleration-time pulse described as follows:

[1] Establish 5 g and 20 g levels on the at curve.

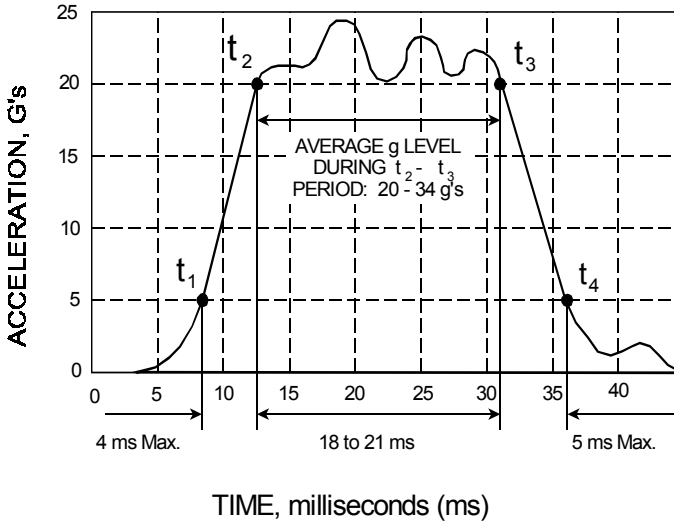
[2] Establish t_1 at the point where the a-t curve first crosses the 5 g level, t_2 at the point where the rising a-t curve first crosses the 20 g level, t_3 at the point where the decaying a-t curve last crosses the 20 g level, and t_4 at the point where the decaying a-t curve first crosses the 5 g level.

[3] $t_2 - t_1$, shall be not more than 4 ms.

[4] $t_3 - t_2$ shall be not less than 18 and not more than 21 ms.

[5] $t_4 - t_3$, shall be not more than 5 ms.

[6] The average deceleration between t_2 and t_3 shall be not less than 20 g's and not more than 34 g's.



APPENDIX B....Continued:

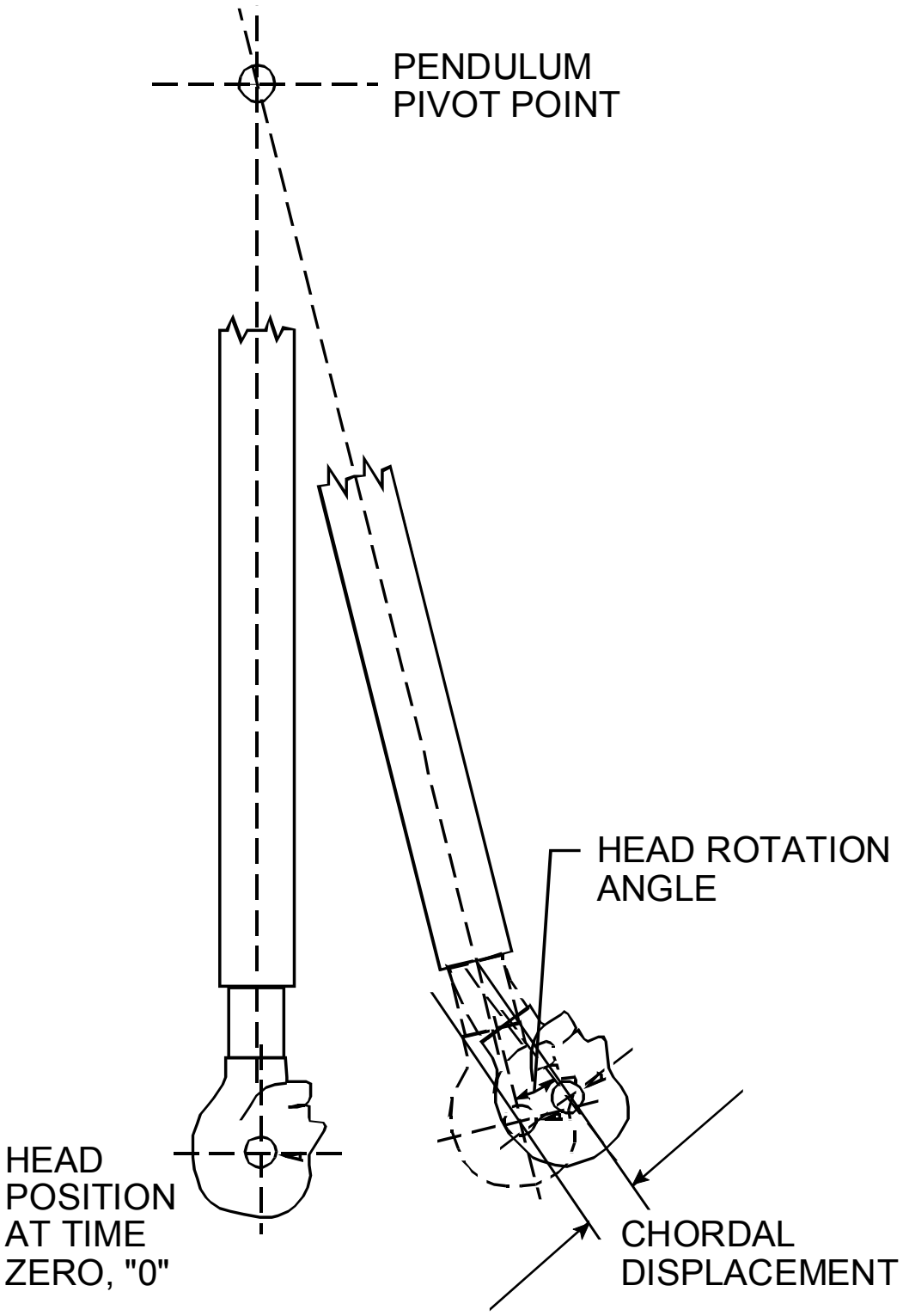


FIGURE B-5

APPENDIX B....Continued:

NECK COMPONENT TEST

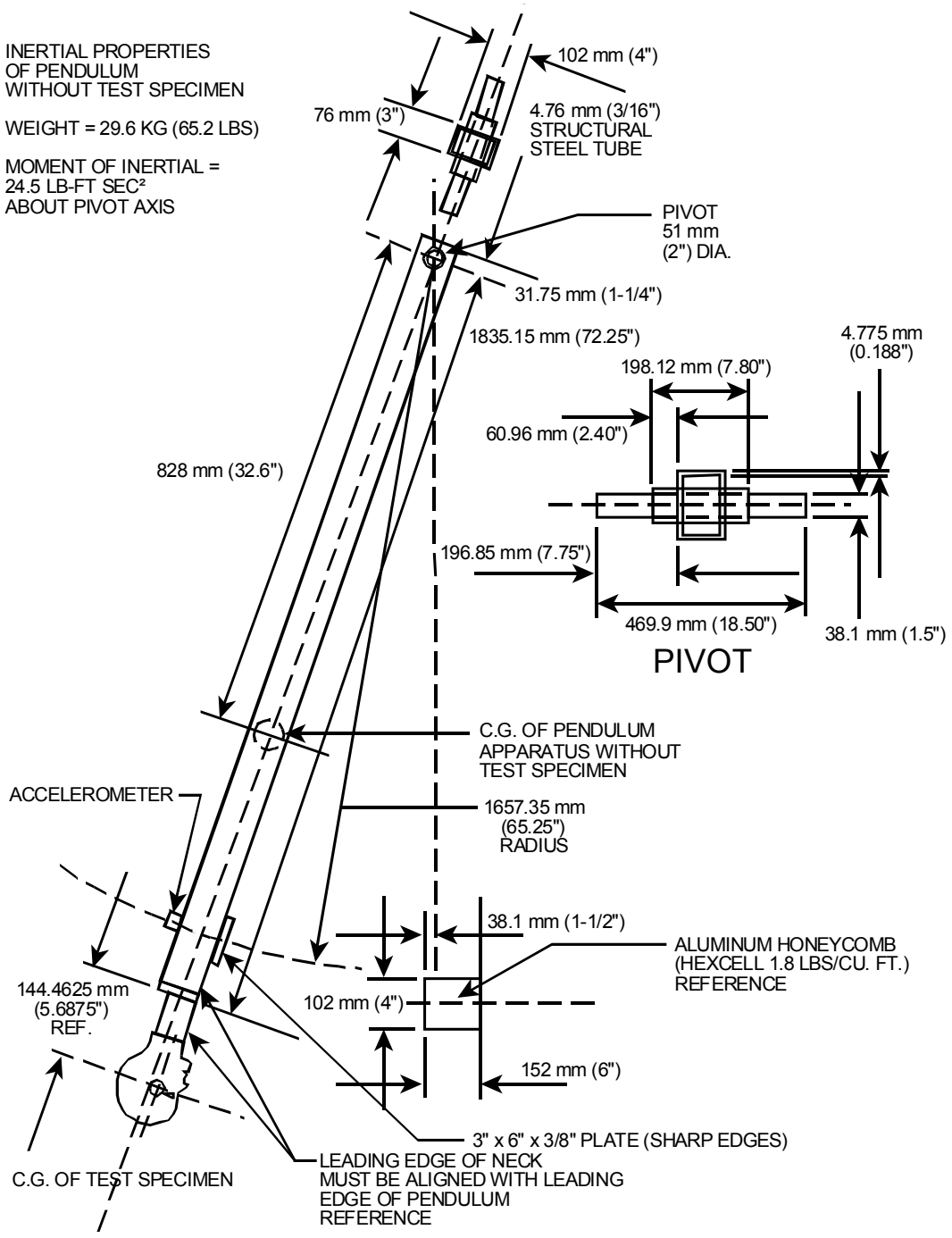


FIGURE B-6

APPENDIX B....Continued:

(3) Allow the neck to flex without contact of the head or neck with any object other than the pendulum arm.

(4) Allow a time period of at least 1 hour between successive tests of the head and neck.

D. THORAX

(1) When impacted by a test probe conforming to 5.A.(1)(a) at 13 fps in accordance with paragraph (c) of this section, the peak resultant accelerations at the location of the accelerometers mounted in the chest cavity in accordance with 5.A.(8) shall be not less than 50g's and not more than 70g's. The acceleration-time (a-t) curve for the test shall be unimodal at or above the 30g level and shall lie at or above the 30g level for an interval not less than 2.5 ms and not more than 4.0 ms. The lateral acceleration shall not exceed 5g's.

(2) TEST PROCEDURE:

(A) With the dummy seated without back support on a surface as specified in 5.A.(8), as shown in Figures B-7 and B-8, and oriented as specified in 5.A.(8), adjust the dummy arms and legs until they are extended horizontally forward parallel to the midsagittal plane, the joints of the limbs are adjusted at any setting between 1g and 2g's, which just supports the limbs' weight when the limbs are extended horizontally forward.

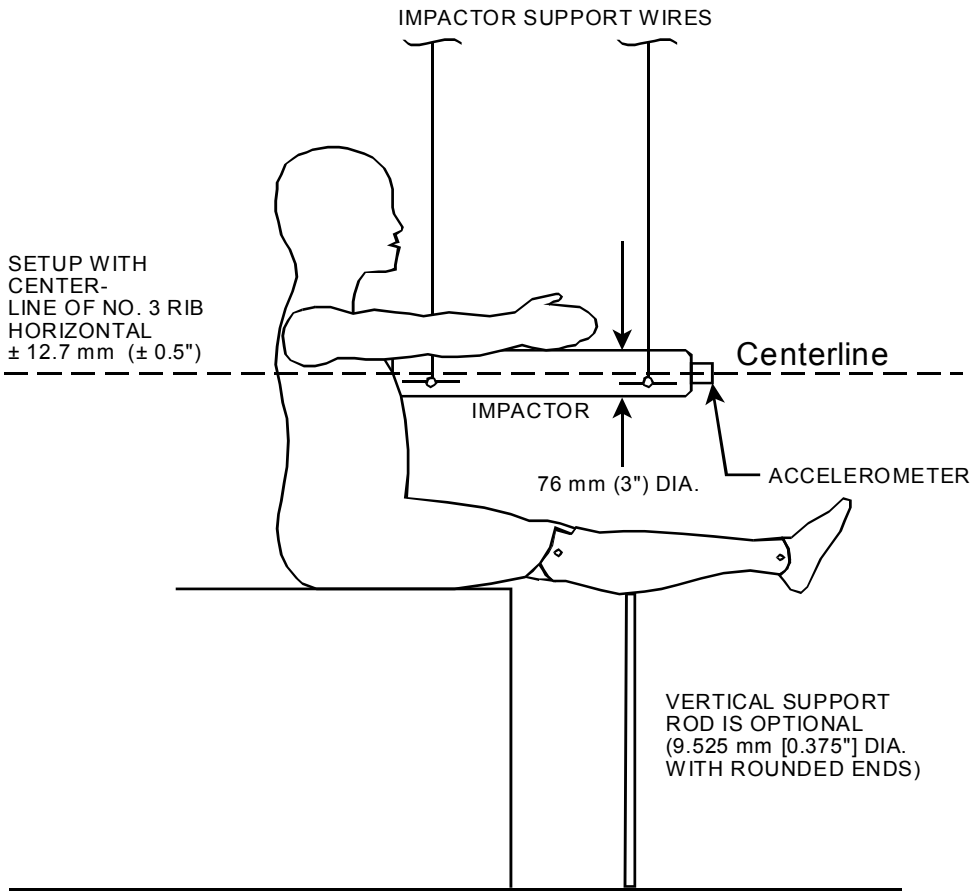
(B) Establish the impact point at the chest midsagittal plane so that it is 38.1 mm (1.5 inches) below the longitudinal centerline of the bolt that attaches the top of the ribcage sternum to the thoracic spine box.

(C) Adjust the dummy so that the tangent plane at the surface on the thorax immediately adjacent to the designated impact point is vertical and parallel to the face of the test probe.

(D) Place the longitudinal centerline of the test probe to coincide with the designated impact point and align the test probe so that at impact its longitudinal centerline coincides within 2 degrees with the line formed by intersection of the horizontal and midsagittal planes passing through the designated impact point.

APPENDIX B....Continued:

THORAX IMPACT TEST SETUP



NOTES:

1. DUMMY IMPACT SENSORS NOT USED IN THIS TEST MAY BE REPLACED BY EQUIVALENT DEAD WEIGHTS.
2. NO EXTERNAL SUPPORTS ARE REQUIRED ON THE DUMMY TO MEET SETUP SPECIFICATIONS
3. THE MIDSAGITTAL PLANE OF THE DUMMY IS VERTICAL WITHIN ± 1 DEGREE
4. THE MIDSAGITTAL PLANE OF THE HEAD IS CENTERED WITH RESPECT TO THE LONGITUDINAL CENTERLINE OF THE PENDULUM WITHIN 3.05 mm (0.12").

FIGURE B-7

APPENDIX B....Continued:

CHEST IMPACT TEST

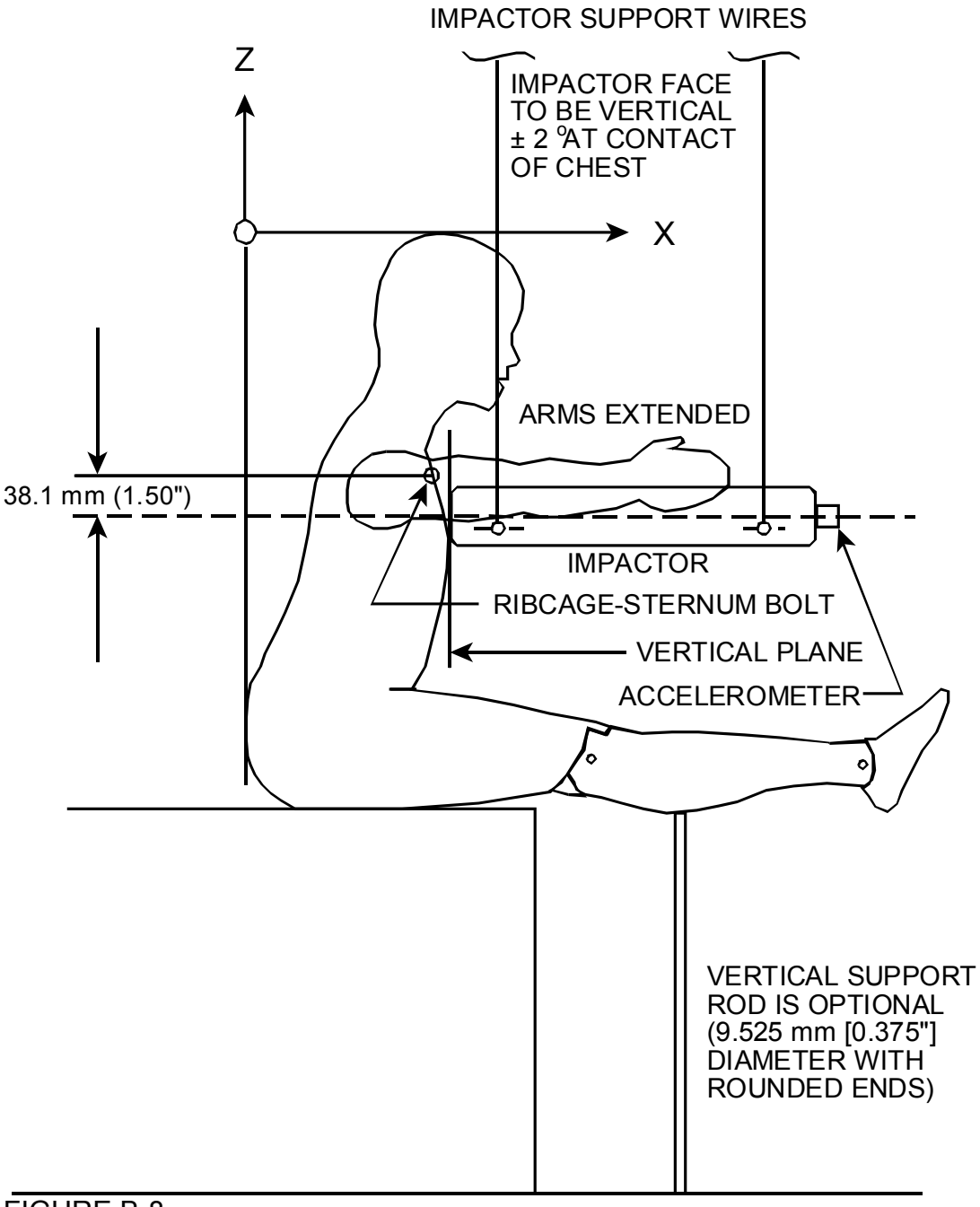


FIGURE B-8

APPENDIX B....Continued:

(E) Impact the thorax with the test probe so that at the moment of impact the probe's longitudinal centerline falls within 2 degrees of a horizontal line in the dummy midsagittal plane.

(F) Guide the probe during impact so that it moves with no significant lateral, vertical or rotational movement.

(G) Allow a time period of at least 20 minutes between successive tests of the chest.

E. LUMBAR

(1) When subjected to continuously applied force in accordance with paragraph (2)(d) of this section, the lumbar spine assembly shall flex by an amount that permits the rigid thoracic spine to rotate from its initial position in accordance with Figure B-10 by 40 degrees at a force level of not less than 151 N (34 pounds) and not more than 209 N (47 pounds), and straighten upon removal of the force to within 5 degrees of its initial position.

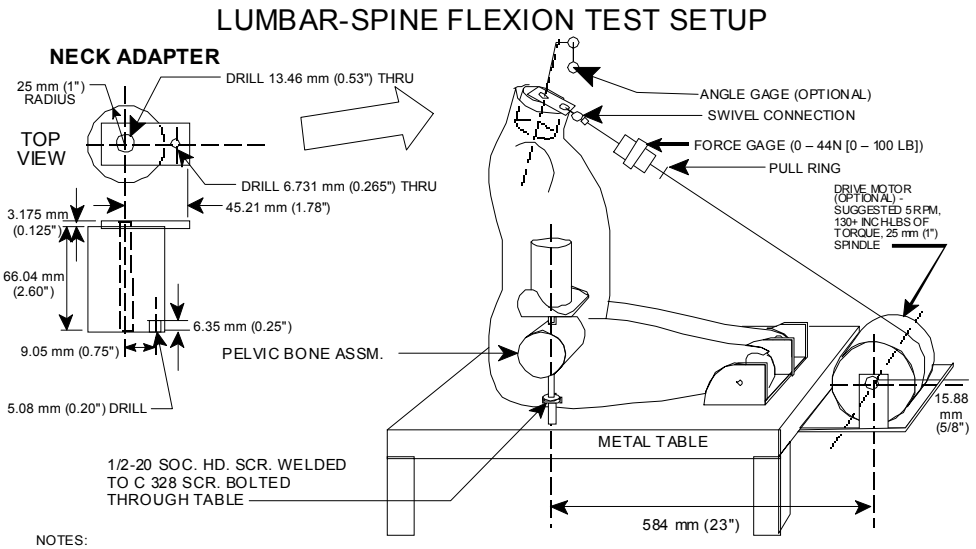
(2) TEST PROCEDURE:

(A) The dummy with lower legs removed is positioned in an upright seated position on a seat as indicated in Figures B-9 and B-10, ensuring that all dummy component surfaces are clean, dry and untreated unless otherwise specified.

(B) Attach the pelvis to the seating surface by a bolt C/328, modified as shown in Figures B-9 and B-10, and the upper legs at the knee axial rotation joints by the attachments shown in Figures B-9 and B-10. Tighten the mountings so that the pelvis-lumbar joining surface is horizontal and adjust the femur ball flange screws at each hip socket joint to 5.6 N-m (50 inch pounds) torque. Remove the head and the neck and install a cylindrical aluminum adapter 50.8 mm (2.0 inches) in diameter and 71.12 mm (2.80 inches) long in place of the neck.

(C) Flex the thorax forward 50 degrees and then rearward as necessary to return to its initial position in accordance with Figure B-9 unsupported by external means.

APPENDIX B....Continued:



NOTES:
1. DUMMY IMPACT SENSORS NOT USED IN THIS TEST MAY BE REPLACED BY EQUIVALENT DEAD WEIGHTS.
2. NO EXTERNAL SUPPORTS ARE REQUIRED ON THE DUMMY TO MEET SETUP SPECIFICATIONS.
3. THE MIDSAGITTAL PLANE OF THE DUMMY IS VERTICAL WITHIN ± 1 DEGREE.
4. THE DUMMY IN THE SEATED POSITION IS FIRMLY AFFIXED TO THE TEST BENCH AT THE PELVIC BONE AND AT THE KNEES.
5. THE PULL-FLEXION FORCE APPLIED THROUGH A RIGID NECK ADAPTOR WHICH IS MOUNTED ON TOP OF THE THORACIC STERNUM ASSEMBLY (C/601), IS ALIGNED WITH THE MIDSAGITTAL PLANE OF THE DUMMY WITHIN ± 1 DEGREE.
6. THE SWIVEL FOR THE FORCE MEASURING SENSOR MUST NOT BIND OR BOTTOM OUT THROUGH THE ENTIRE LOADING CYCLE.

FIGURE B-9

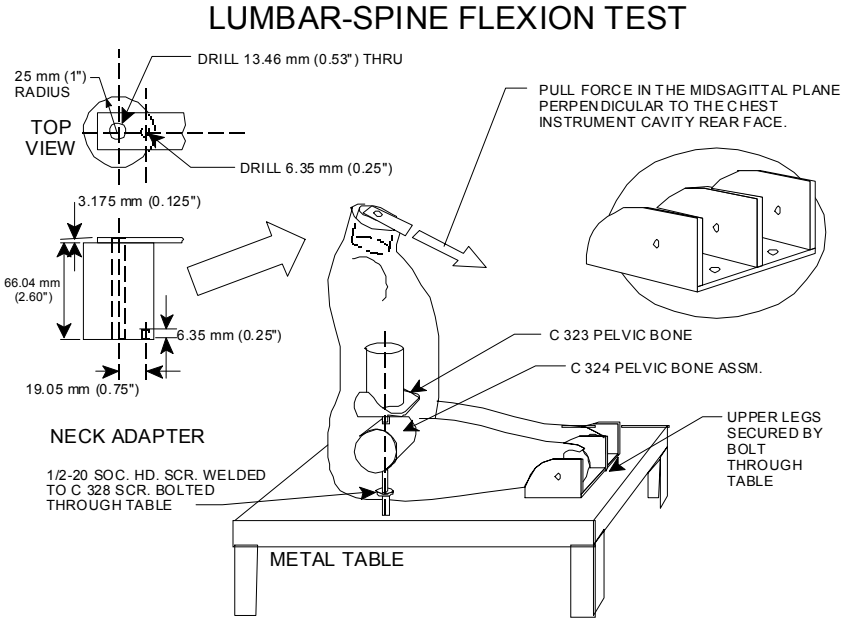


FIGURE B-10

APPENDIX B....Continued:

(D) Apply a forward pull force in the midsagittal plane at the top of the neck adapter as shown in Figures B-9 and B-10, so that at 40 degrees of the lumbar spine flexion the applied force is perpendicular to the thoracic spine box. Apply the force at any torso deflection rate between 0.5 and 1.5 degrees per second up to 40 degrees of flexion but no further; continue to apply for 10 seconds the force necessary to maintain 40 degrees of flexion, and record the highest applied force at that time. Release all force as rapidly as possible and measure the return angle 3 minutes after the release.

6. CHILD DUMMY VERIFICATION TEST REPORTS

Pretest and posttest verification data sheets shall be included as an appendix to the FMVSS 213 final test report. However, at the end of each restraint system test program (unless otherwise instructed by the COTR), the laboratory will submit six copies of a final child dummy verification test report for each NHTSA child dummy used in the restraint system dynamic test program. This final report will summarize the pretest and posttest verification data for one particular Part 572 child dummy in sequence by date. In other words, all head impact test data will be summarized, all head-neck pendulum test data will be summarized, etc.

Each Part 572 child dummy verification final test report shall have a standard report cover first page and title page. The other pages of the report shall be compiled in the following sequence:

TABLE OF CONTENTS ---

A. Child Dummy Verification Test Data Sheets

B. Discussion of Test Results

C. Photographs of the Dummy in Each Stage of Calibration

D. List of Test Equipment (Calibration Dates, Accuracy, etc.)

E. Detailed Laboratory Test Procedure

7. DATA SHEETS

DATA SHEET A-1
SUMMARY OF HEAD IMPACT TEST VERIFICATION DATA

CHILD DUMMY I.D. NO.: _____

TEST MEASUREMENT	PRETEST DATA	POST TEST DATA	P572 REQUIREMENT
TEST DATES			
ROOM TEMPERATURE, °C (°F)			19 - 26 °C (66 - 78°F)
ROOM RELATIVE HUMIDITY, %			10 - 70%
TEST PROBE IMPACT VELOCITY, mps (fps)			2.1 to 2.2 mps (6.86 to 7.14 fps)
PEAK HEAD RESULTANT ACCEL., g			95 - 118g
PEAK HEAD LATERAL ACCEL., g			≤7g
PULSE Δ TIME @ 50g, ms			2 - 3 ms

REMARKS:

Technician: _____ Date: _____

Project Manager: _____

7. DATA SHEETS....Continued

DATA SHEET A-2
SUMMARY OF HEAD-NECK PENDULUM TEST DATA

CHILD DUMMY I.D. NO.: _____

TEST MEASUREMENT	PRETEST DATA	POST TEST DATA	P572 REQUIREMENT
TEST DATES			
ROOM TEMPERATURE, °C (°F)			19 - 26 °C (66 - 78°F)
ROOM RELATIVE HUMIDITY, %			10 - 70%
PENDULUM IMPACT VELOCITY, mps (fps)			4.9 to 5.5 mps (16 to 18 fps)
PENDULUM MIN./MAX. DECEL. OVER (t_3 - t_2), g			20 - 34g
PEAK HEAD RESULTANT ACCEL., g			≤ 30g
PENDULUM DECEL. PULSE Δ TIME (t_2 - t_1), ms			≤4 ms
PENDULUM DECEL. PULSE Δ TIME (t_3 - t_2), ms			18 - 21 ms
PENDULUM DECEL. PULSE Δ TIME (t_4 - t_3), ms			≤ 5 ms
HEAD ZERO POSITION TIME/ PENDULUM REVERSAL TIME			- / -
HEAD MAX. ROTATION ANGLE, degrees			76 - 92°
TIME (ms) @ HEAD ROT. ANGLE			
0°			-2 - +2 ms
30°			17.3 - 24.7 ms
60°			31.1 - 40.9 ms
Max.			55 - 69 ms
60°			81.7 - 100.3 ms
30°			97.4 - 118.6 ms
0°			111.2 - 134.8 ms
CHORD. DISPL. (in.) @ HEAD ANGLE OF-			
0°			
30°			
60°			
Max.			
60°			
30°			
0°			

7. DATA SHEETS....Continued

REMARKS:

Technician: _____ Date: _____

Project Manager: _____

7. DATA SHEETS....Continued

DATA SHEET A-3
SUMMARY OF CHEST IMPACT TEST DATA

CHILD DUMMY I.D. NO.: _____

TEST MEASUREMENT	PRETEST DATA	POST TEST DATA	P572 REQUIREMENT
TEST DATES			
ROOM TEMPERATURE, °C (°F)			19 - 26 °C (66 - 78°F)
ROOM RELATIVE HUMIDITY, %			10 - 70%
TEST PROBE IMPACT VELOCITY, mps (fps)			3.9 to 4 mps (12.87 to 13.13 fps)
PEAK CHEST RESULTANT ACCEL., g			50 - 70g
PEAK CHEST LATERAL ACCEL., g			≤ 5g
PULSE ΔTIME @ 30g, ms			2.5 - 4.0 ms

REMARKS:

Technician: _____ Date: _____

Project Manager: _____

7. DATA SHEETS

DATA SHEET A-4
SUMMARY OF LUMBAR FLEXION TEST DATA

CHILD DUMMY I.D. NO.:

TEST MEASUREMENT	PRETEST DATA	POST TEST DATA	P572 REQUIREMENT
TEST DATES			
ROOM TEMPERATURE, °C (°F)			19 - 26 °C (66 - 78°F)
ROOM RELATIVE HUMIDITY, %			10 - 70%
FORCE @ 40□ FLEXION ANGLE, kg (lbs)			15.4 to 21.3 kg (34 to 47 lbs)
SPINAL COLUMN ANGLE @ 3 MIN. POST TEST, DEGREES			≤5°

REMARKS:

Technician: _____ Date: _____

Project Manager: _____